

What is claimed is:

1           1.     An apparatus that measures electrical characteristics of an electrical  
2 element within a semiconductor device in a packaged state, comprising;  
3           an electrical characteristic measurer that is connected to the electrical element  
4 and a pad of the semiconductor device, and that is driven in response to a control  
5 signal to output a value that is indicative of the electrical characteristics of the electrical  
6 element to the pad,  
7           the control signal being activated in an electrical characteristic measuring mode,  
8 after the semiconductor device is packaged.

2           2.     The apparatus of claim 1, further comprising a control signal generator  
3 that receives at least one bit of an address signal that is received at an address pin of  
4 the semiconductor device, and that generates the control signal responsive thereto.

3           3.     The apparatus of claim 1, wherein the electrical element is selected from  
4 a group including an NMOS transistor, a PMOS transistor and a resistor, and the value  
5 is indicative of one of a threshold voltage and a saturation current of the NMOS  
6 transistor, one of a threshold voltage and a saturation current of the PMOS transistor,  
7 and a resistance of the resistor.

1           4.     The apparatus of claim 1, wherein the electrical characteristic measurer  
2 includes an NMOS transistor having a drain and a source, the drain being connected to  
3 the pad and the source being connected to a terminal of the electrical element, a size of  
4 the NMOS transistor being the same as a size of an NMOS transistor connected to a  
5 pad of a data input/output pin.

1           5.     The apparatus of claim 1, wherein the electrical element is a transistor,  
2     and the value is indicative of one of a threshold voltage and a saturation current of the  
3     transistor.

1           6.     The apparatus of claim 5, wherein the transistor is an NMOS transistor.

1           7.     The apparatus of claim 5, wherein the transistor is a PMOS transistor.

1           8.     The apparatus of claim 1, wherein the electrical element is a resistor, and  
2     the value is indicative of a resistance of the resistor.

1           9.     An apparatus for measuring characteristics of an electrical element within  
2     a semiconductor device in a packaged state, comprising:

3                 a control signal generator, coupled to receive an address signal of the  
4     semiconductor device, that generates a control signal; and

5                 an electrical characteristic measurer, to which the electrical element is  
6     connected, that is driven responsive to the control signal to output a value indicative of  
7     the electrical characteristics of the electrical element.

1           10.    The apparatus of claim 9, wherein the electrical element is one of a  
2     transistor and a resistor, the electrical characteristic measurer comprising at least one  
3     transistor characteristic measuring unit that measures the electrical characteristics of  
4     the transistor, and a resistor characteristic measuring unit that measures the electrical  
5     characteristics of the resistor, as selectable by the control signal.

1           11.    The apparatus of claim 10, wherein the electrical characteristics of the  
2     transistor are one of a threshold voltage and a saturation current.

1           12.    The apparatus of claim 10, wherein the electrical characteristics of the  
2 resistor is a resistance.

1           13.    The apparatus of claim 10, wherein the control signal generator generates  
2 the control signal responsive only to two bits of the address signal.

1           14.    The apparatus of claim 9, wherein the control signal is generated during  
2 an electrical characteristic measuring mode, after the semiconductor device is  
3 packaged.

1           15.    A method of measuring electrical characteristics of an electrical element  
2 within a semiconductor device in a packaged state, comprising:

3                connecting the electrical element of the semiconductor device to an electrical  
4 characteristic measurer, after the semiconductor device is packaged;

5                controlling the semiconductor device to enter into a predetermined electrical  
6 characteristic measuring mode;

7                generating a control signal; and

8                driving the electrical characteristic measurer responsive to the control signal, to  
9 provide a value indicative of the electrical characteristics of the electrical element.

1           16.    The method of claim 15, wherein said controlling comprises:  
2 receiving an address signal provided to an address pin of the semiconductor  
3 device; and

4                entering into a specific sub mode of the electrical characteristic measuring mode  
5 responsive to a value of at least one bit of the address signal.

1           17.    The method of claim 15, wherein the electrical element is selected from a  
2 group including an NMOS transistor, a PMOS transistor and a resistor, and wherein the  
3 value provided during said driving is indicative of one of a threshold voltage and a  
4 saturation current of the NMOS transistor, one of a threshold voltage and a saturation  
5 current of the PMOS transistor, and a resistance of the resistor.